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GRAPHS AND DATA DISPLAYS

Most of you think you already know this subject. You probably had enough classroom experience with graphs to feel comfortable with the simpler ones. But do you have a broad understanding of the various techniques, and do you always look critically at graphs? If not, this Primer is for you: its purposes are to review the sorts of graphs used most commonly in public health and to sound a warning about their misuses.

Graphs are pictures of data. Pictures are easier to grasp than tables of numbers, so for the sake of clear communication we try where possible to turn our data into pictures. Sometimes the results become cultural traditions. The bell-shaped, normal curve from statistics is a model that parents use to think about the heights of five-year-olds or their scores on a test. And news magazines traditionally report government spending using circular pie charts cut into slices that represent the amounts of money.

While some pictures of data are simple enough, others are based on complicated theory and may require quite a bit of effort to appreciate. And some graphs, as we shall see, are difficult because they misrepresent data. But wherever graphs are well presented they have enormous appeal, and no amount of words or intellectual effort will quite catch up with their intuitive worth. A graph is the sort of thing you cannot completely learn from definition: you must rather get to know it as you get to know a smell or a taste, the "atmosphere" of a small town, or the personality of an individual.

Arithmetic and Logarithmic Graphs

Typical graphs show values of a variable Y plotted against values of another variable X. Several kinds of graphs are illustrated in the figures. The familiar arithmetic graph, e.g., Figure 1, is the simplest. Regular calibrations on the axes (the X and Y reference lines) define a constant unit distance all over the graph. So a unit of response in the Y variable, no matter where it occurs or what its direction, always has the same physical size on the paper. Most of us got to know the arithmetic graph in high school algebra.

Widely used and very important, logarithmic graphs are distinquished by axes with logarithmic scaling. A common variation is the semilogarithmic graph, exemplified by Figure 2 which actually shows two plots on one set of axes. Figure 2 is semilogarithmic because only the vertical Y axis is scaled logarithmically; the horizontal X axis has ordinary arithmetic scaling. The obvious feature of a logarithmic axis is that distances become increasingly compressed: thus, in Figure 2, the nine units from 1 to 10 cover the same physical distance on the Y axis as the 90 units from 10 to 100, or as the 900 units from 100 to 1,000. A unit of response clearly shrinks in physical size as